# PATENT SPECIFICATION

DRAWINGS ATTACHED

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Int. Cl.:—F 02 b, f

COMPLETE SPECIFICATION

## Improvements in or relating to Internal Combustion Engines

I, JAGDISH RAJ CHHABRA, an Indian citizen, of 3A/72 Western Extension Area, Satnagar, Karol Bagh, New Delhi, India, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to an internal combustion engine of the type in which air is mixed with fuel in a metering device, whence the fuel-air mixture passes to a combustion space through an inlet passage, pipe, conduit or manifold, herein called for convenience an inlet passage. The fuel may be for example petrol, the metering device may be for example a carburettor, and the combustion space may be for example the top part of a cylinder with inlet and exhaust valves and a sparking plug.

An object of the invention is to improve the efficiency of an internal combustion engine, and more particularly to improve the efficiency of fuel mixture supply to an engine.

According to this invention an internal combustion engine of the type referred to has a tubular screen of perforated material disposed in the inlet passage so that fuel-air mixture enters an open end of the screen which is movable for varying the area of perforated material through which the mixture passes when leaving the interior of the screen.

The device improves the turbulence and thereby diffusion evaporation of the mixture, and it improves mixing of the fuel with air, making the mixture more homogeneous.

At slow speed, suction is low, flow of the mixture is slow and lethargic, and turbulence is at its lowest, hence mixing of the fuel with air is poor, break up of the fuel drop lets is inefficient, and is reflected in poor working of the engine, improper use of the fuel, and may lead to crank case dilution. At high speed when suction is high and turbulence better, there is less need for improvement, and the resistance of the device is then reduced to provide freer flow whilst still assisting and enhancing turbulence, because a small portion, for instance the lower portion of a cylindrical wire mesh screen device, remains in the mixture flow path.

According to another feature of the invention a trap or reservoir for liquid fuel is provided, and may be a body of loosely packed wire mesh or iron shavings placed in the manifold well, and preferably of conical shape, being held in place by a spring wire base, so that no portion of the same interferes with the normal flow of the mixture. Any fuel in liquid form which fails to be carried in the air stream will drop into the trap and be held in suspense by the loosely packed mesh until it is picked up by the fuel-air mixture, in vapour or semi-liquid form, and used. This prevents flow of raw fuel to the combustion space, and thereby improves the efficiency of the engine, eliminates crank case dilution, and prolongs the life of the engine.

Another feature of the invention is the heating of the fuel before it reaches the metering device. This is more for use with lower grade and heavier fuels like kerosene or even for mild warming of petrol during severe winter conditions. The heating medium may be hot engine coolant water.

The fuel heating means may comprise a chamber in the water circulation system, the fuel supply pipe passing through the chamber. The flow of hot water, and hence heating of the fuel, is controlled by a valve to this chamber: eg. if more heat, as in the case of kerosene, is required the flow of hot water can be at the maximum and if no heat is required the supply of hot water is cut off by keeping the valve closed. The hot water is returned to the engine cooling system through a non-return valve.

Similarly another chamber may be provided



[*Price*

in the water circulation for heating the combustion air, by being passed around heated pipes. The supply of the heating medium and hence the heating of the combustion air is also controlled by a valve in the hot water circuit. The chamber consists of three parts:— the first part for receiving the hot water and connecting the heat exchange pipes; the second part the heat exchange pipes; and the third part is connected to the heat exchange pipes and receives the hot water from them and discharges it to the engine cooling water circulation, through a non-retrun valve. The part in which the heat exchange pipes are installed has an outlet and inlet for the combustion air, which, while passing through the heated pipes in contact with them, becomes heated before it is delivered to the carburettor for mixing with the fuel. The heating medium may also be hot exhaust gas from the engine.

An embodiment of the invention will now be described in more detail by way of example, with reference to the accompanying drawings, in which:—

Figure 1 is a schematic perspective view of a cylindrical wire mesh screen device;

Figure 2 is a schematic top plan;

Figure 3 is a schematic section of an arrangement comprising a fuel pre-heater, carburettor, inlet manifold, and wire mesh screen device; and

Figures 4 and 5 are similar to a part of Figure 3, but showing the throttle valve and the screen device in further operating positions.

Figure 1 shows a cylindrical brass wire mesh screen device 1, having three zones A, B and C. Zone A is of fine mesh (say 16 mesh, 30 S.W.G.); zone B is of less fine mesh (say 12 mesh, 28 S.W.G.); and zone C is of relatively coarse mesh (say 8 mesh, 24/26 S.W.G.). Thus if a downwardly flowing fuel-air mixture enters at the open top of device 1 and leaves laterally through the screen (as will be described below with reference to Figure 3) it will be appreciated that zone A offers greater resistance to flow, zone B less resistance than zone A, and zone C less resistance still. Also shown in Figure 1 are vertical spacer bars 2 brazed to the outside of device 1.

Although screen device 1 is shown as having three separate zones each of different mesh size, it is possible instead to have a screen device having a progressively varying mesh size.

Figure 2 is a schematic top plan showing device 1 located in a throttle passage 3 by spacer bars 2, which not only locate device 1, but ensure that it moves up and down smoothly and that it is uniformly spaced all round from passage 3. This improves turbulence at the wall of passage 3.

Figure 3 is a schematic view showing features of the invention. In the lower part of the Figure is seen device 1 in position in an inlet manifold which has a vertical branch or throttle passage 3 and horizontal branches 4 with passages 5 leading to the combustion spaces (not shown) of a four cylinder engine. In passage 3 are indicated a throttle valve 6 pivoted at 7 a venturi 8, a fuel jet 9, and an air inlet 10. It will be seen, with reference also to Figure 2, that device 1 can be moved vertically in passage 3, guided and spaced therefrom by spacer bars 2. Fuel is fed to jet 9 from float chamber 11, with a float 12 and needle valve 13 for metering the fuel from a supply pipe 14.

A quadrant 15 is fixed to throttle valve 6. This quadrature has a groove 16. Fixed to valve 6 and arranged to fit in groove 16 is a connecting wire 17, which at its lower end is fixed at 17A to device 1. A tension coil spring indicated at 18 is also fixed at 17A to device 1 and at its lower end spring 18 is fixed at 18A to a horizontal branch 4. Spring 18 tends always to pull device 1 down to its lowest position which is shown in Figure 3.

Figure 4 shows the position of device 1 with throttle valve 6 part open; it will be seen that device 1 has been raised, so that it presents considerably less resistance to flow of mixture from passage 3 into branches 4.

Figure 5 shows the position of device 1 with throttle valve 6 wide open; in this position only zone C of device 1 projects down into branches 4.

The purpose of device 1 is to create turbulence in the flowing fuel-air mixture, to give a more homogeneous and better burning mixture. Its resistance and its effect is greatest when throttle opening is small and mixture flow slow. Its resistance is least when throttle opening is large and mixture flow rapid.

Also seen in Figures 3 to 5 is a trap or reservoir 19. This is a conical body, with its point upwardly directed, as shown, against the direction of fuel mixture flow, and it is composed of loosely packed wire mesh or iron shavings. Body 19 is fixed to branches 4 below passage 3. Its purpose is to trap any liquid fuel falling through device 1, retaining such liquid fuel until it is vapourised or otherwise picked up by the mixture flow.

In the upper part of Figure 3 is shown a fuel heating device, for heating the fuel before it passes through pipe 14 to needle valve 13. The fuel heating device is a container 20 in which is a pipe coil 21 through which fuel is passed from an inlet 22 to the outlet to pipe 14 in contact with a heating medium (not shown) within container 20 and in contact with the exterior of pipe coil 21. The heating medium in this case is the hot engine coolant water, entering at 23 a thermostatic device 24 for controlling the water supply to container 20. The water outlet is indicated at 25.

WHAT I CLAIM IS:—

1. An internal combustion engine of the type referred to, wherein a tubular screen of perforated material is disposed in the inlet passage so that fuel-air mixture enters an open end of the screen which is movable for varying the area of perforated material through which the mixture passes when leaving the interior of the screen.

2. An engine according to claim 1 wherein the perforated material is wire mesh.

3. An engine according to claim 1 or claim 2 wherein the screen fits slidably in a correspondingly tubular portion of the inlet passage.

4. An engine according to any one of the preceding claims wherein the screen is movable in accordance with movement of a throttle valve of an associated carburettor.

5. An engine according to claim 4 wherein the screen is connected to the throttle valve.

6. An engine according to claim 2 wherein the screen device is arranged in an inlet manifold, the mesh aperture size increasing in the direction of fuel-air mixture flow and the device being connected to the throttle valve of an associated carburettor for movement in accordance with the throttle valve movement, so that resistance produced by the screen to fuel-air mixture flow is reduced as the throttle valve is opened.

7. An engine according to any one of the preceding claims wherein the fuel is heated before it reaches a carburetting device.

8. An engine according to claim 7 wherein the fuel passes through a pipe whose exterior is in contact with engine coolant water.

9. An engine according to claim 8 wherein the temperature of the water in contact with the pipe is thermostatically controlled.

10. An engine according to any one of the preceding claims wherein a trap or reservoir for liquid fuel is arranged beyond the screen in the flow direction.

11. An engine according to claim 10 where- the trap or reservoir is a body composed of loosely packed wire mesh or iron shavings and held in place in the inlet passage.

12. An engine according to claim 11 wherein the body is conical, with the point directed against the direction of mixture flow.

13. An internal combustion engine of the kind referred to, substantially as herein described, with reference to the accompanying drawings.

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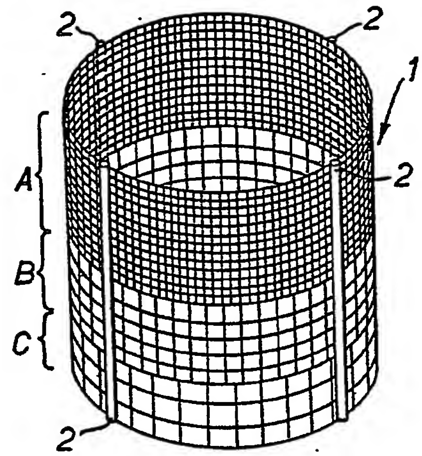
FIG. 1.



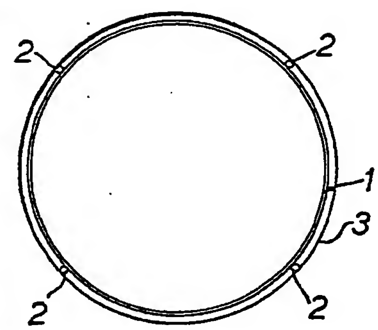




FIG. 2.

FIG. 4.

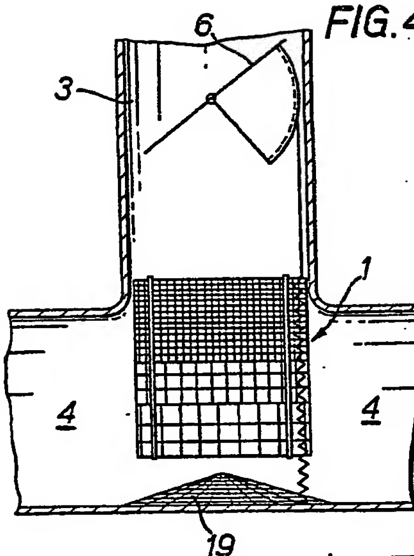
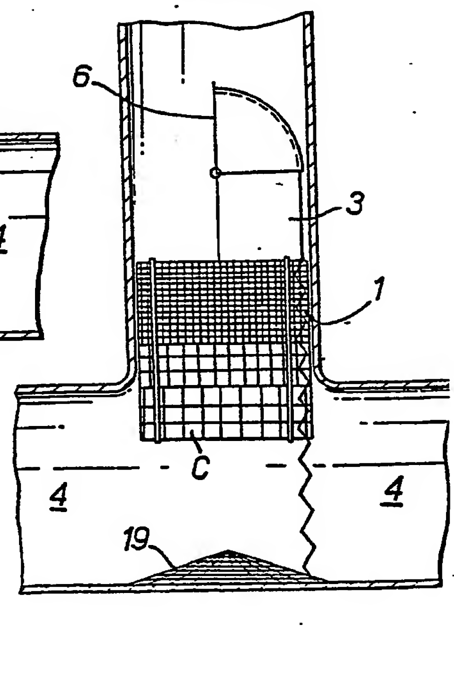



FIG. 5.



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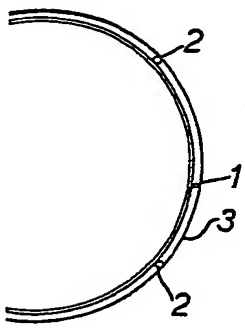
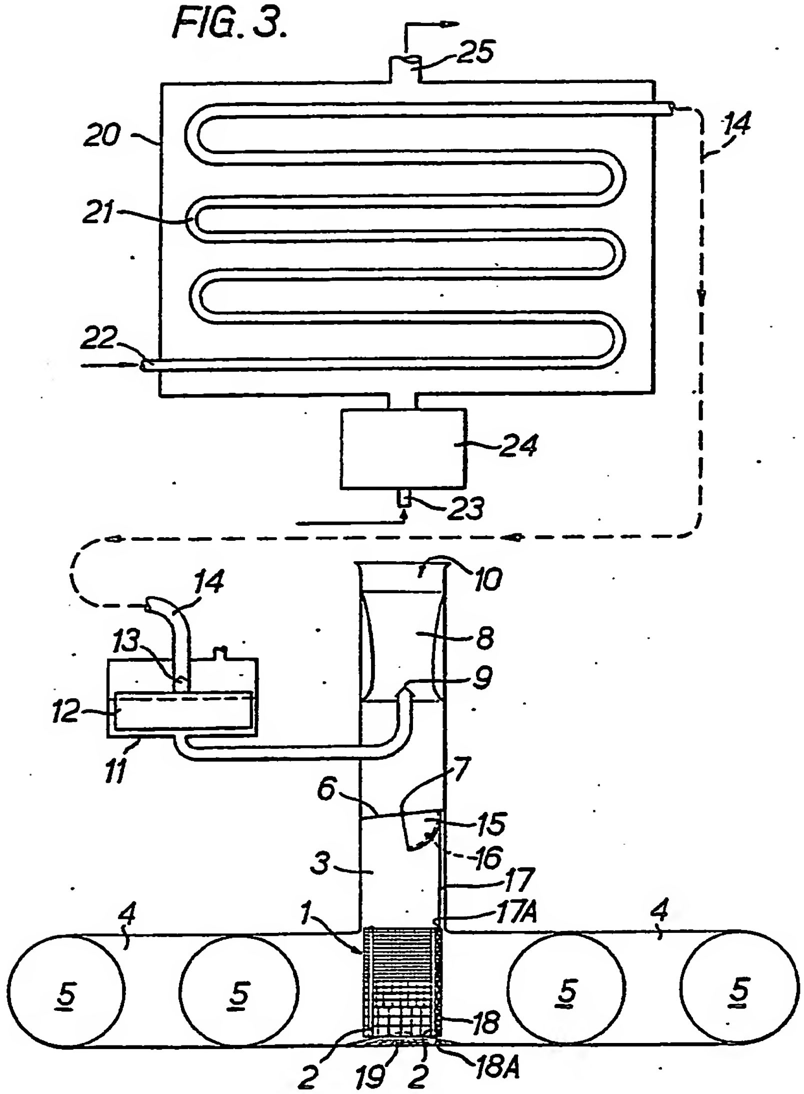
2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheets 1 & 2




G. 2.

FIG. 3.




G. 5.

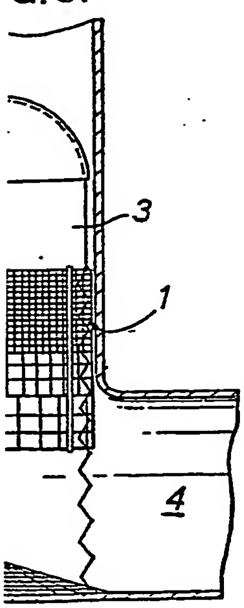
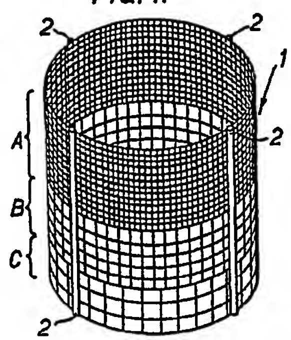


FIG. 1.



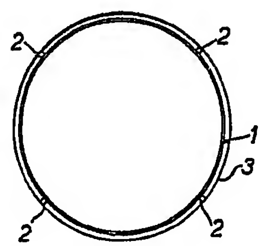




FIG. 2.

FIG. 3.

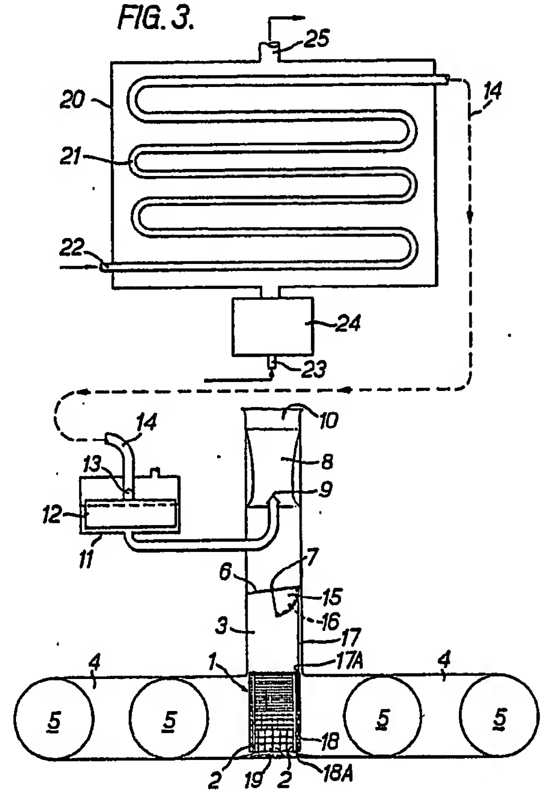



FIG. 4.

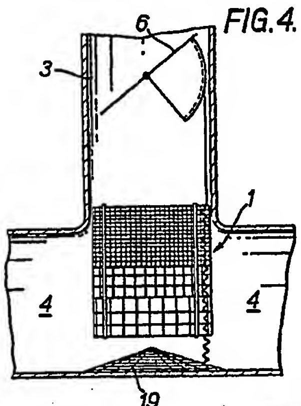



FIG. 5.